

Amendments to the Claims:

The following listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently Amended) An apparatus for ~~measuring~~ determining a high resolution surface displacements, displacement measurement relative to a target surface, the apparatus comprising:

a light source ~~which arranged to project~~ projects a beam of light upon a ~~target surface; and~~

a detector arranged to receive light reflected from the target surface and configured to provide image data corresponding to the received light, wherein the detector that has a number of pixels at least about 50% larger than a largest number of pixels that are included in a pixel address window that defines image data that is used by the apparatus for determining the high resolution used for a surface displacement measurement;

signal generating and processing circuitry operable to determine the high resolution surface displacement measurement, the signal generating and processing circuitry including a controller configured to determine the pixel address window and a memory including a pixel address window definition portion,
wherein:

the controller is configured to determine the pixel address window such that the pixel address window consists of a subset of pixels on the detector which have the best or sufficient image intensity and uniformity characteristics;

the signal generating and processing circuitry is configured to determine a pixel correlation area that has an area smaller than the pixel address window, and which defines a number of pixel elements that will overlap in two successive correlation images and

participate in correlation calculations used determine the high resolution surface displacement measurement; and

the signal generating and processing circuitry is configured to determine the high resolution surface displacement measurement based on the pixel correlation area and the image data defined by the pixel address window.

2-4. (Canceled)

5. (Currently Amended) The apparatus of claim 1, further comprising:

an illumination beam aperture located between a light emitting element of the light source and the target surface, wherein the illumination beam aperture is configured to block light from a beam profile output by the light emitting element such that only light from a central portion of the beam profile output by the light emitting element is included in the beam directed onto the target surface~~an aperture which blocks light in the beam at an intensity less than about 80% of a maximum beam intensity.~~

6. (Canceled)

7. (Currently Amended) The apparatus of claim 6, wherein the signal generating and processing circuitry~~further comprising comprises~~ a comparing circuit which performs a correlation calculation using the pixels in the correlation area.

8. (Currently Amended) The apparatus of claim ~~2~~1, wherein the pixel address ~~area window is~~has dimensions between about 200 and about 300 pixels on each side.

9. (Currently Amended) The apparatus of claim 1, wherein the light source is a source of coherent radiation, and the beam spot contains a speckle pattern in the light reflected from the target surface.

10. (Original) The apparatus of claim 1, wherein the light source is an incoherent light source, and the surface includes a scale pattern indicative of displacement.

11. (Currently Amended) The apparatus of claim 21, wherein the signal generating and processing circuitry is configured to determine a figure of merit for the pixels in the pixel address window, wherein the figure of merit is indicative of the best or sufficient image intensity and uniformity characteristics~~pixel address area contains pixels having a predetermined threshold intensity and a predetermined threshold contrast compared to neighboring pixels.~~

12. (Currently Amended) A method for operating an apparatus for measuring a determining a high resolution surface displacement measurement relative to a target surface, the apparatus comprising a light source; a detector that has a number of pixels at least 50% larger than a largest number of pixels that are included in a pixel address window that defines image data that is used for determining the high resolution surface displacement measurement; signal generating and processing circuitry operable to determine the high resolution surface displacement measurement, the signal generating and processing circuitry including a controller configured to determine the pixel address window and a memory including a pixel address window definition portion, wherein the method for operating the apparatus comprises:

directing a beam of light from a~~the~~ light source onto a~~the~~ target surface;

reflecting the beam from the target surface and into a beam spot on a~~the~~ detector, wherein the detector has a number of pixels at least 50% larger than the number used in a surface displacement measurement;

determining the pixel address window such that the pixel address window consists of a subset of pixels on the detector which have the best or sufficient image intensity and uniformity characteristics;

determining a pixel correlation area that has an area smaller than the pixel address window, and which defines a number of pixel elements that will overlap in two

successive correlation images and participate in correlation calculations used determine the high resolution surface displacement measurement subset of pixels of the detector which are to be used in the surface displacement measurement; and

determining the measuring a high resolution surface displacement measurement using the subset of pixels based on the pixel correlation area and the image data defined by the pixel address window.

13. (Currently Amended) The method of claim 12, further comprising:
performing an interpolation to determine the high resolution surface displacement measurement.

14. (Currently Amended) The method of claim ~~13~~12, wherein the ~~subset is a pixel address window, containing~~contains between about 40000 and about 90000 pixels.

15. (Currently Amended) The method of claim ~~13~~12, wherein the step of determining step comprises determining a pixel address window comprises determining a figure of merit indicative, ~~wherein the pixel address window includes the subset of pixels on the detector which have of~~ the best or sufficient image intensity and uniformity characteristics.

16. (Currently Amended) The method of claim ~~15~~12, wherein the detector has an area at least ~~about~~ 4 times larger than the pixel address window.

17. (Canceled)

18. (Currently Amended) The method of claim ~~17~~12, wherein the pixel correlation area contains between about 10000 and about 22500 pixels.

19. (Currently Amended) The method of claim 12, wherein the apparatus further comprises an illumination beam aperture located between a light emitting element of the light source and the target surface and the method further comprising~~comprises~~:

~~providing an aperture which using the illumination beam aperture to blocks~~
~~light in from a beam profile output by the light emitting element such that only light from a~~
~~central portion of the beam from the beam profile output by the light emitting element is~~
~~included in the beam directed onto the target surface having an intensity less than a predefined~~
~~threshold intensity.~~

20. (Currently Amended) The method of claim 19, wherein the illumination beam aperture is used to block light all light from the beam profile predefined threshold that has an intensity that is less than about 80% of a maximum beam intensity of the beam profile.

21. (Currently Amended) The method of claim 12, further comprising:
decoding image data included in the pixel address window, the image data
corresponding to a pattern applied to the target surface and illuminated by the beam that is
directed onto the target surface, to determine a first resolution absolute position measurement
value corresponding to an amount of displacement which position of the apparatus relative to
the target surface has undergone.

22. (Canceled)